

**REMARKS**

Claims 1-21 are present in this application. Claims 2 and 8-21 have been withdrawn. Of the elected claims, claim 1 is independent.

**Claim Rejection – 35 U.S.C. § 112**

Claim 2 has been rejected under 35 U.S.C. § 112, first paragraph, as failing to comply with the enablement requirement. Claim 2 has been withdrawn. Accordingly, Applicants request that the rejection be withdrawn.

**Claim Rejection – 35 U.S.C. § 102(b)**

Claim 1 is rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent 5,283,799 (Jacquet) in view of JP 02-137383 (Ishikawa). Applicants respectfully traverse this rejection.

Embodiments of claim 1 are directed to a semiconductor laser in which at least one electrode of a first polarity (e.g., 1, 2) and an electrode of a second polarity (e.g., 5, 6) is divided to allow current to be injected independently into a light-amplifying region (e.g., 3) and a saturable absorber region (e.g., 4).

According to the present specification at page 23, by having a current injected into the light-amplifying region independently of current injected into the saturable absorber region, the hysteresis can be controlled to decrease the lasing threshold and thereby drive the laser with a lower current or adjust the amplitude of the optical output. In particular, intensity of the

additional noise is appropriately adjusted and then added to the modulation current. Thus, the value of the current to be injected is changed at random around the central value of the modulation current. Subsequently, the maximum value of the modulation current and a change in intensity of the additional noise are stochastically synchronized and a temporal transition to the upper hysteresis path can occur.

Claim 1 had been amended to express “an optical output modulated to arise stochastic resonance.

In a section “Response to Arguments,” the Office Action indicates that the added limitation would not be given patentable weight because the limitation occurs in the preamble.

Claim 1 has been rejected based on the combination of Jacquet and Ishikawa. Ishikawa is shown in the present application as Figs. 16 and 17.

In the present specification at page 8, it is stated that, “as shown in Figs. 16 and 17, a certain bias current from V1 to V2 is applied to saturable absorber region 162, so that the lasing threshold current varies between  $I_{h1}$  and  $I_{h2}$  to produce a modulated optical output P.”

Thus, it can be seen that Ishikawa does appear to teach adjusting the lasing threshold, but does not disclose an optical output modulated to arise stochastic resonance.

Applicants submit that none of the cited references including Jacquet and Ishikawa teach or suggest the stochastic resonance phenomenon as recited in claim 1 as amended.

Applicants request that the rejection be reconsidered and withdrawn.

**Claim Rejection – 35 U.S.C. § 103(a)**

Claims 3 and 5-7 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Jacquet and Ishikawa in view of U.S. Patent 6,205,161 (Kappeler). Applicants respectfully traverse this rejection.

At least for the same reasons as above for claim 1, Applicants submit that claims 3 and 5-7 are patentable as well.

The Office Action relies on Kappeler for teaching the additional features of claim 3.

The Office Action presents an additional argument that, “the condition that the optical output be large is not necessarily limiting as written, since an output could very well be considered large if compared with a device that has no output whatsoever.”

Kappeler teaches superimposing a noise signal to generate multiple modes inside the diode. Figure 7 of Kappeler shows a progression from a single mode (Fig. 7a) to several modes (Fig. 7c). Thus, it can be seen that application of the noise signal of Kappeler is not for the purpose of increasing the amplitude of the optical output. Claim 3 has been amended to clarify this distinction. In particular, claim 3 has been amended to recite,

“...so as to [allow] increase amplitude of said modulated optical output [to have a large amplitude] and achieve an effect of reducing the feedback-induced noise.”

Thus, Applicants submit that Kappeler fails to teach or suggest at least the claimed, “the intensity of said modulation current and the intensity of said noise current are adjusted with respect to each other so as to increase amplitude of said modulation optical output and achieve an effect of reducing the feedback-induced noise.”

For at least these additional reasons, Applicants request that the rejection be reconsidered and withdrawn.

**Claim Rejection – 35 U.S.C. § 103(a)**

Claim 4 has been rejected under 35 U.S.C. § 103(a) as being unpatentable over Jacquet and Kappeler, in view of U.S. Patent 5,394,260 (Suzuki). Applicants respectfully traverse this rejection.

At least for the same reasons as above for claims 1 and 3, Applicants submit that claim 4 is patentable as well.

Claim 4 recites an additional feature that the modulation current preferably has a rectangular wave.

The Office Action relies on Suzuki for teaching the feature of claim 4 of a modulation current having a rectangular wave. Suzuki discloses an electro-absorption type optical modulator 2 driven by a rectangular voltage (Embodiment 2, col. 7, line 66, to col. 8, line 11). The optical modulator is part of an optical pulse generator (Fig. 2A). The pulsed output of the optical pulse generator is shown in Fig. 2B.

It can be seen that Suzuki teaches application of a rectangular voltage to a pulse generator in order to produce a pulse signal having short optical pulses. Regarding claim 4, Suzuki teaches application of a rectangular voltage to a pulse generator in order to produce a pulse signal having short optical pulses. Suzuki does not disclose increasing amplitude of a modulation current and

achieving an effect of reducing feedback-induced noise, as required by claim 4 in the context of claim 3.

Thus, Applicants request that the rejection be reconsidered and withdrawn.

### **Conclusion**

In view of the above amendment, Applicants believe the pending application is in condition for allowance.

Should there be any outstanding matters that need to be resolved in the present application, the Examiner is respectfully requested to contact Robert W. Downs (Reg. No. 48,222) at the telephone number of (703) 205-8000, to conduct an interview in an effort to expedite prosecution in connection with the present application.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any additional fees required under 37 C.F.R. §§ 1.16 or 1.17; particularly, extension of time fees.

Dated: July 28, 2006

Respectfully submitted,

By

  
Charles Gorenstein

Registration No.: 29,271

BIRCH, STEWART, KOLASCH & BIRCH, LLP  
8110 Gatehouse Road  
Suite 100 East  
P.O. Box 747  
Falls Church, Virginia 22040-0747  
(703) 205-8000